6.0 CUMULATIVE IMPACTS TO SURFACE WATER PROJECTED BY THE MODEL

Results of the cumulative impact analysis in the Powder River Basin under Wyoming's Alternative 2A and Montana's Preferred Alternative E are presented in Table 6-1. The analysis at the Tongue River station near Ashland, Montana, incorporates all existing and future forecast CBM development in the Tongue River watershed from Wyoming and Montana. The analysis at the Powder River station at Locate, Montana, incorporates the existing and future forecast CBM development in the Little Powder and Powder River drainages in Wyoming and the future forecast development in the Montana portion of those drainages. Potential impacts to water quality are discussed below.

After the water mixes, surface water flow in the Tongue River at Ashland, Montana, would increase moderately during low-flow conditions. The resultant water quality in the stream would increase slightly in EC and SAR from existing conditions. The resultant mixed stream water can be compared with the available surface water criteria:

- MRPL: The water quality in the Tongue River at Ashland, Montana currently exceeds the MRPL for EC and SAR; thus, any additional discharge that would reach the main stem would likely cause further degradation in terms of suitability for irrigation if the states and EPA conclude that the MRPL is protective of irrigation uses.
- LRPL: Under modeled conditions, the resultant water quality would be adequate to meet the LRPL for both EC and SAR under mean monthly flow during all months of the year and during 7Q10 flow conditions.
- Ayers and Westcot diagram: Irrigation with the resultant mixed water quality indicates that there is not likely to be a reduction in infiltration during mean monthly or 7Q10 flow conditions. During the low monthly flow, essentially 100 of the CBM discharge could occur without causing potential effects to infiltration.

After the water mixes, surface water flow in the Powder River at Locate, Montana, would increase approximately two-fold during low-flow conditions. The resultant stream water quality would increase slightly in EC and more significantly in SAR from existing conditions. The resultant mixed stream water can be compared with the available surface water criteria:

- MRPL: The water quality in the Powder River at Locate, Montana, currently exceeds the MRPL for EC and SAR; thus, any additional discharge that would reach the main stem would likely cause further degradation in terms of suitability for irrigation if the states and EPA conclude that the MRPL is protective of irrigation uses.
- LRPL: Under modeled conditions, both constituents would be less than the LRPL, with the exception of the SAR during minimum mean monthly flow.
- Ayers and Westcot diagram: Irrigation with the resultant quality of the mixed water indicates a reduction in infiltration is not likely during mean monthly or 7Q10 flow conditions. During the low monthly flow, essentially 100 of the CBM discharge could occur without causing potential effects to infiltration.

Modeling indicates that the suitability of the Tongue River for irrigation may be compromised by the surface discharge of CBM produced water during maximum CBM development in both states. Still, existing interstate agreements have been developed to minimize impacts to water quality until such time

that protective standards are put in place and the assimilative capacity can be equitably divided among the states and tribes. Surface discharge to the Tongue River from CBM development in both states currently

Table 6-1
Cumulative Surface Water Impact Analysis

Alternative	Station	Most Restrictive Proposed Upper Limit		Least Restrictive Proposed Upper Limit		Existing Stream Water Quality Minimum Mean Monthly Flow			Resulting Stream Water Quality at Minimum Mean Monthly Flow			Existing Stream Water Quality 7Q10 Flow			Resulting Stream Water Quality 7Q10 Flow		
		SAR	EC (µS/cm)	SAR	EC (µS/cm)	Flow (cfs)	SAR	EC (µS/cm)	Flow (cfs)	SAR	EC (µS/cm)	Flow (cfs)	SAR	EC (µS/cm)	Flow (cfs)	SAR	EC (µS/cm)
Wyoming 2A and Montana E	Tongue River below Brandenburg Bridge near Ashland, MT	0.5	500	10	2500	207	1.36	1016	214	2.5	1058	70	1.82	1281	76	4.95-5.31	1368-1377
	Powder River at Locate, MT	2.0	1000	10	3200	143	4.6	2287	250	13.1	2361	1.6	6.87	3313	109	21.6-24.3	2384-2473

Notes:
SAR = Sodium adsorption ratio
EC = Electrical conductivity
cfs = Cubic feet per second
µS/cm = Microsiemens per centimeter
7Q10 = The minimum flow averaged over 7 consecutive days that is expected to occur on average, once in any 10-year period.

is controlled by the two state DEQs, which have agreed to an interim "no new discharge" policy that would not authorize untreated surface discharge of CBM waters to the Tongue River unless the quality of the discharged water was at or near the existing water quality in the Tongue River.

Cumulative effects to the suitability for irrigation of the Powder River would be minimized through the interim MOC the two DEQs have entered. The MOC was developed to ensure that designated uses downstream in Montana would be protected while CBM development in both states continued. As the states develop a better understanding of the effects of CBM discharges through the enhanced monitoring required by the MOC, they can adjust the permitting approaches to allow more or less discharges to the Powder River drainage. Thus, water quality standards can be met, and downstream uses can be maintained.